

## Food Science and Technology



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## REFERÊNCIA

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# Personal characteristics of coffee consumers and non-consumers, reasons and preferences for foods eaten with coffee among adults from the Federal District, Brazil

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## Abstract

The aim of this study is to describe the characteristics of consumers and non-consumers, the reasons and foods associated with coffee intake among adults from the Federal District, Brazil. This is a cross-sectional population-based survey conducted by telephone interview (n= 1,368). We collected information on detailed coffee intake, socio-demographic aspects and personal characteristics. The coffee had an average daily intake of 319 mL. Individuals were more likely to drink coffee at an older age (68%) and with higher body mass index (58%). The most cited reason for consuming coffee was the “personal pleasure” (48%), followed by “habit / tradition” of consuming coffee. Among non-consumers of this beverage, the main reason was not liking the taste and / or aroma of coffee (62%). The method of coffee preparation used was by infusion (86%) and sugar was the main sweetener used by 83% of consumers. The majority of consumers (59%) reported consuming coffee with certain foods such as bakery products. The results from our study may suggest that the popularity of coffee can be attributed to its taste, personal pleasure and habit, and the consumption is more likely to occur with the advance of age and with intake of other foods.

**Keywords:** coffee; consumption; Brazilians; taste; beverage.

**Practical Application:** Our study permitted evaluation of personal characteristics of coffee consumers and non-consumers, different methods of coffee preparation, including caffeinated, decaffeinated, filtered and non-filtered, as well as the choice, reasons and preferences for foods eaten with coffee. Given that the potential interest of our results is from Brazilian readers and the increase interest of the functional properties of coffee there are potential for citations and downloads from the scientific community, regulatory agencies, industry, and public health professionals.

## 1 Introduction

Coffee is one of the most popular beverages in the world, and the latest 2014/2015 coffee trade statistics estimated that world coffee export amounted to about 110.7 million bags. Brazil is the world's largest coffee producer, with exports finished on 36.3 million bags (International Coffee Organization, 2015).

In fact well conduct review research have shown the importance of chemical compounds found in coffee, suggesting potential beneficial and protective effects to the coffee drinker's health (Dorea & Da Costa, 2005; Natella & Scaccini, 2012). After removal of the flesh from the coffee berries, the dried seeds are roasted and develop their unique bitter aroma. Coffee is a complex chemical mixture, and its most abundant studied components are caffeine and chlorogenic acids followed by other polyphenols and methylxanthines. Coffee is also a source of nicotinic acid, potassium, and magnesium (Higdon & Frei, 2006).

Since coffee is rich in antioxidants and provides some readily available nutrients it has been associated with a healthy profile in consumers, and hence considered as a functional

food (Dorea & Da Costa, 2005). Indeed, regular coffee drinking (depending on the quantity consumed) can directly affect the intake of micronutrients (K, Mg, Mn, Cr, niacin) and antioxidant substances. Improvements in mental alertness, concentration, wakefulness and athletic performance are well documented benefits (Heckman et al., 2010; Nawrot et al., 2003). Coffee consumption has also been associated with weight loss, improved glucose tolerance and lower risk of type 2 diabetes, reduced risk for incidence of Parkinson's disease and improvement in Parkinson's symptoms, and reduced risk for cancer (Higdon & Frei, 2006; Butt & Sultan, 2011; Floegel et al., 2012).

On the other hand, some beverages, and among them coffee, are vehicles of caffeine. Health concerns about adverse effects have been attributed to caffeine intake, especially for children and pregnant women (Heckman et al., 2010). It is indicated that a moderate daily caffeine intake of  $\leq 400$  mg was not associated with any adverse effects for healthy adults (Butt & Sultan, 2011). For pregnant women and children a dose of  $< 300$  mg/d and  $< 2.5$  mg/kg body weight/day, respectively, presented no adverse

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effects in clinical trials (Nawrot et al., 2003). Only intake of caffeine in medications is related to a life-threatening overdose (Heckman et al., 2010). Adverse effects of caffeine from food intake depend on body weight and personal sensitivity and involve symptoms such as headache, drowsiness, anxiety, increased blood pressure and nausea (Nawrot et al., 2003; Butt & Sultan, 2011). The caffeine content of coffee is variable, depending on the variety of coffee beans and method of preparation. The content of a commercial blend used by the majority of subjects interviewed in the Federal District was 146 mg/100mL (Machado et al., 2011).

Concerns about adverse effects and benefits associated with coffee (and attendant caffeine intake) shown by epidemiological studies are likely to be influenced by social and metabolic profiles of studied populations (Machado et al., 2011). Coffee is a source of antioxidants, licit stimulants, fluid and nutrients in the diet; hence, aspects related to the demographics of consumers and non-consumers, the reasons for consumption and non-consumption, methods of preparation and foods associated with coffee intake have long been of interest. Thus, the current study aimed to describe the pattern of coffee consumption with food and personal characteristics among adults from the Federal District, Brazil.

## 2 Methods

This is a descriptive-analytic study of coffee consumers and non-consumers. The study design consists of a cross-sectional population-based survey with adult subjects living in the Federal District. The Federal District is one of 27 federal units of Brazil, consisting of the country's capital (Brasília) and several other satellite towns and communities covering an area of 5,801.9 km<sup>2</sup> and with an estimated population of 2.6 million people from the last census in 2010 (Instituto Brasileiro de Geografia e Estatística, 2010).

The sample was randomly drawn from mobile and residential telephone lists obtained from the local telephone companies. Due to the high cost of mobile calls, we defined that 80% of the sample would be from residential numbers and 20% from mobile numbers. For sample calculation, a coffee intake prevalence of 91% was considered. Precision of 1.5% and a significance level of 5% were adopted and a sample of 1440 calculated for the Federal District. The telephone interview was conducted by a team of trained nutrition undergraduate students and one of the authors (LMMM). The interview was recorded electronically (PCTEL version 1.0, Brasília, Brazil) and the questionnaire answers were recorded directly into a computer using Epi Info version 6.04d (CDC, USA).

A simple-standardized questionnaire validated in a pilot study performed before the main study was applied. The questionnaire was based on the Behavioral Risk Factor Surveillance System (BRFSS), which had been previously validated (Nelson et al., 2001). We collected information through a telephone interview based on detailed coffee intake, socio-demographic aspects, physical activity, cigarette smoking, alcohol intake and self-reported weight and height. Self-reported weight and height have been previously validated in Brazil (Peixoto et al., 2006) and in Brasília (Thomaz et al., 2013).

Inclusion criteria were age  $\geq 18$  years and agreement to participate in the study. For residential telephones a permanent resident was invited to enter the study and for mobile telephones the owner was contacted. In the case of two phone lines for the same address or individual the first interview was kept, the telephone number excluded and the following selected number contacted. Exclusion criteria included  $< 18$  years of age, incomplete data in the questionnaire and any person who did not agree with the term of consent. When a number was called more than ten times and we received no answer or only a standard recorded message from the phone company, that number was excluded. This study was conducted according to the guidelines laid down in the Declaration of Helsinki, and all procedures involving human subjects were approved by the Research Ethics Committee of the University of Brasília Faculty of Health Sciences (020/2006). The participants were properly informed of the objectives of the study and oral informed consent was obtained from all of them; consent was recorded electronically.

The database was compiled and typed in the program Epi Info version 6.04d. The descriptive statistics was made of all the variables related to the pattern of coffee consumption: reasons to consume and not consume coffee, reason to consume coffee at work, how to prepare and sweeten coffee, methods of coffee preparation and food eaten together with coffee. In order to ensure the external validity of the study to represent the population of the Federal District a weighting procedure was adopted. The values of the variables were weighted by sex, age and years of study. The weights used in this weighting procedure were determined by the ratio between the proportions of individuals from the 2000 Census and the sample (Sistema IBGE de Recuperação Automática, 2000). The statistical analyses were done using Excel version 2010, SPSS version 13.0 (IBM, NY, USA) and SAS version 9.3 (SAS Institute Inc., Cary, NC, USA). The Rao-Scott Chi-Square Test was run to ascertain statistical differences between categorical variables (categories of coffee intake with sex, age, years of education, marital status, alcohol and supplement use, cigarette smoking, physical activity practised, body mass index – BMI classes) and was also used to compare the prevalence of coffee consumption obtained by the 2008-2009 Household Budget Survey (HBS) (Thomas et al., 1996; Instituto Brasileiro de Geografia e Estatística, 2011).

## 3 Results

Initially, in order to confirm the external validity of our research, a comparison was performed with the prevalence of coffee consumption obtained by the 2008-2009 HBS in the Federal District. The 2008-2009 HBS conducted by the Brazilian Institute of Geography and Statistics (IBGE) provides a national database of household food availability and individual consumption (Instituto Brasileiro de Geografia e Estatística, 2011).

The comparison of prevalence of coffee consumption obtained in two studies showed that the prevalence of coffee intake in their various categories (0 mL; 1-49 mL; 50-120 mL;  $> 120$  mL) does not differ significantly between the two studies ( $p = 0.3054$ ). The conclusion obtained from running the comparison test confirms that they are similar in describing the frequency of coffee consumption, which provides an assurance

that our sampling adequately represents the adult coffee intake in the Federal District.

Interviews were conducted with 1,368 subjects, which correspond to 95% of the calculated sample. Sample loss was mainly due to residential location outside the Federal District. Among the subjects interviewed, 247 (19%) reported not consuming coffee, while 1121 (81%) are coffee consumers. The coffee had high variability in daily consumption, a range 1-5333 mL per day, and an average daily intake of 319 ml (SD:384). There were 81% (1104) subjects contacted via residential telephone and 19% (264) by mobile telephone calls.

Results are presented in three categories according to the volume size of Brazilian coffee cups (50ml small and 120ml large coffee cups). A majority of males (48%) and females (51%) presented daily coffee intake of >120 mL. Individuals were more likely to drink coffee at an older age, presenting a marital or other form of stable relationship and declaring consumption of alcohol. Overweight and obesity was prevalent among coffee drinkers of >120 mL/day (Table 1).

For the majority of individuals (81%) who are coffee consumers the stated reasons were: 'personal pleasure' (the fact of enjoying the beverage, the pleasant aroma and flavour), with 48% of responses, 'habit' (tradition since childhood, a part of breakfast/snack) with 32% and 'other reasons' (social aspects, smoking, relaxing and to counteract headache) with 14%. Only 4% of respondents reported consuming coffee because they considered it 'stimulating' (improved disposition, concentration and attention). The most cited reasons for not consuming coffee were 'not liking' the taste and/or aroma of coffee (62%), followed by 'other reasons' (medical recommendation, anxiety, religion and insomnia) with 13%, 'is bad for health' (10%) and 'not having the habit' of consuming coffee (6%) (Figure 1).

The methods of coffee preparation most commonly used by participants were 'infusion' (86%) followed by 'infusion or soluble' (7%). In the case of 'infusion' there were two different methods of preparation: using a 'cloth strainer' (63%) and 'filter paper' (23%). The use of 'espresso' coffee (1%) was low in the studied population, as well as of 'cappuccino' (0.3%) and 'decaf' coffee (0.03%).

The methods of coffee drinking predominantly reported were 'black' coffee (65%), coffee 'with cow's milk' (23%), the combination of both during the day (8%) and coffee 'with soy milk' (2%).

Sugar was the main way to sweeten coffee (83%), followed by sweetener (12%), and the combination of both during the day (1%). Only 4% of respondents do not use any type of product to sweeten their coffee. In many circumstances the amount of sugar consumed with coffee is added to large containers (frequently a thermos) for family or general consumption. This behaviour makes it difficult to estimate the individual amount of sugar added to coffee.

Regarding the food chosen to eat while drinking coffee, 59% of consumers reported eating some food with coffee, 23% said they sometimes eat some food together with their coffee

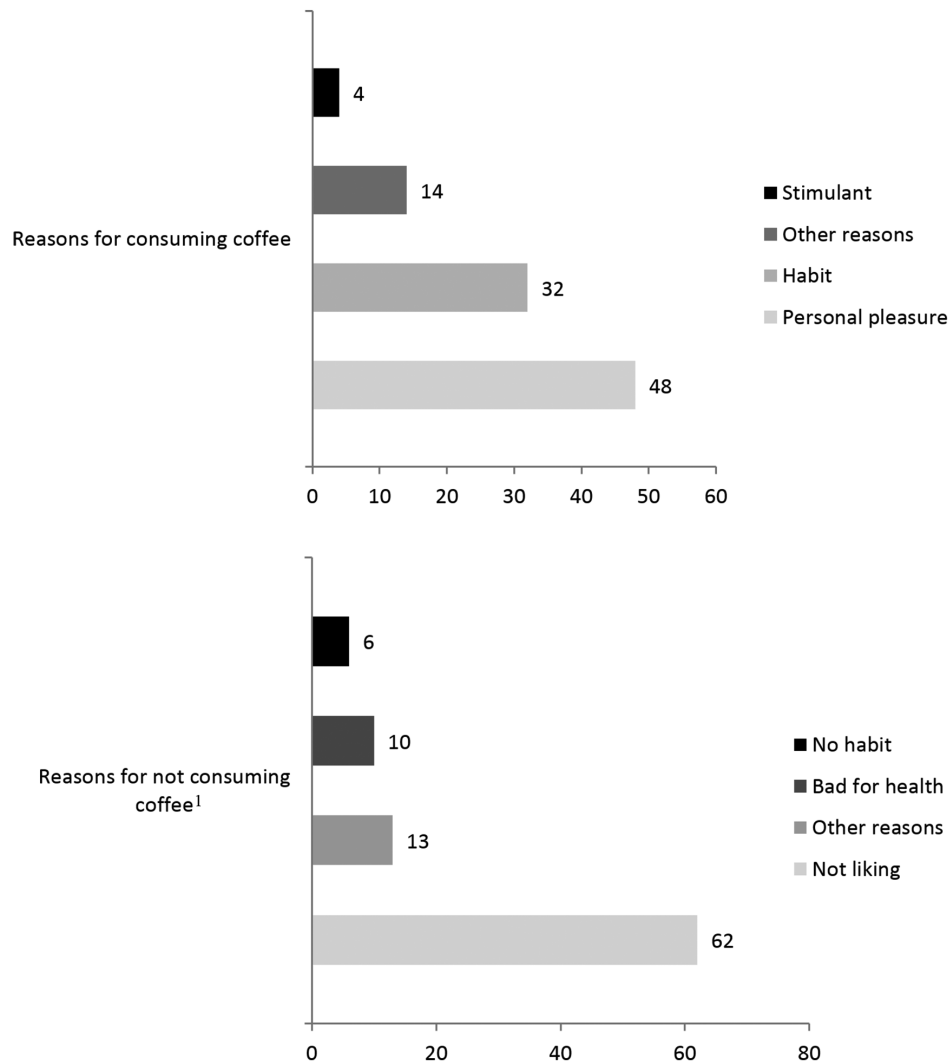
and 17% do not eat any type of food when they drink coffee. The most consumed food with coffee was 'salt bread or French bread' (47%) followed by other types of food (22%) like 'cheese bread', 'cheese' and eggs. On the other hand, 'crackers' (9%), 'sweet cake' (3%) and 'toast' (1%) were the three foods least consumed by respondents in the Federal District.

In relation to the economically active participants (89%), 43% reported consuming coffee at work, while 44% do not maintain this behaviour. The main reasons reported for consuming coffee at work were 'personal pleasure' (30%), 'habit' (30%), 'to relax, relieve anxiety' (10%), 'to wake up' (10%) and 'availability of coffee at work' (8%).

**Table 1.** Population characteristics according to coffee intake groups from individuals in the Federal District, Brazil, 2006-2009.

Parameters	Coffee Intake (ml per day)				P value*
	0 %	1-49 %	50-120 %	>120 %	
<b>Sex</b>					0.6111
Male	18	15	19	48	
Female	20	10	19	51	
<b>Age (years)</b>					0.0039
18-59	20	13	19	48	
≥ 60	8	9	15	68	
<b>Marital Status</b>					<.0001
Single	27	21	19	33	
Married or Consensual Union	11	6	21	62	
Other	19	4	10	67	
<b>Years of education</b>					0.3629
Until 8 years	16	12	24	48	
9-11	24	12	15	48	
≥ 12	19	13	14	54	
<b>Cigarette smoking</b>					0.4421
Current Smoker	12	11	26	52	
Former Smoker	13	9	19	59	
Never Smoker	23	14	17	46	
<b>Alcohol consumption</b>					0.0284
Yes	17	19	16	48	
No	21	7	21	51	
<b>Consumption of supplements</b>					0.4242
Yes	23	18	24	35	
No	19	12	18	51	
<b>Physical Activity</b>					0.2947
Yes	21	15	21	43	
No	17	10	17	55	
<b>BMI classes**</b>					0.0025
Undernutrition	13	37	6	44	
Eutrophic	18	14	24	45	
Overweight	19	10	14	58	
Obesity	24	5	13	58	

\*P value obtained by Rao-Scott Chi-Square test with significance at  $p < 0.05$ ; \*\*BMI= Body Mass Index.



¹Other reasons: medical recommendation, anxiety, religion and insomnia

**Figure 1.** Distribution of the reasons for consuming and not consuming coffee among individuals in the Federal District, Brazil, 2006-2009.

#### 4 Discussion

In this study, we showed that in adults from the Federal District coffee has a high prevalence of intake, and choices of consumption and non-consumption are not related to differences in sex, years of education and the socio-economic and cultural context. Coffee consumption choices involve pleasure in the taste or undesirable experiences and the consumption of coffee are more likely to occur with intake of other foods.

According to a recent survey, the estimated average usual daily coffee intake from the total population was 163 (Standart Erro (SE) = 2.8) mL, and if we assume a cup size to be 120 mL (which is most common in Brazil), this means that coffee intake was approximately 1.5 cups/d (Sousa & Da Costa, 2015). In our study, 81% of respondents are coffee consumers and the average daily intake was 319 mL (2.5 cups/d). However, taking into account the differences in cup size our findings showed a lower volume of coffee intake than in studies done in Europe (Floegel et al.,

2012; Sartorelli et al., 2010; Panagiotakos et al., 2007). The size of a coffee cup in many European countries corresponds to 240 mL, which is double the volume of the typical Brazilian coffee cup. So the mean amount drunk in Europe (2-4 cups/day) corresponds to 4 to 8 Brazilian cups.

In addition, the characteristics variables that presented significant association with coffee consumption, in the Federal District adult population, were: age, marital status, alcohol consumption and nutritional status. Overweight and obesity was prevalent among coffee drinkers of >120 mL/day. In a recent published review coffee has been shown to present contradictory findings concerning its relationship with weight status (St-Onge, 2014). As most of the studies are cross-sectional no plausible causation can be obtained from these studies. One should also bear in mind the possibility of reverse causation with increased frequency of coffee intake in an attempt to achieve weight loss by overweight or obese individuals. This is a plausible possibility



given the observed associations between coffee consumption and obesity, whilst coffee presents a thermogenic effect that assists with weight loss (St-Onge, 2014; Lopez-Garcia et al., 2013).

The main reason found in our study for non-consumption of coffee was having no liking for the taste and/or the aroma of coffee. In Brazil, Arruda et al. (2009) published research showing the justifications and motivations for coffee consumption and non-consumption and also found that the main reason for non-consumption of coffee was having no liking for the taste, which may be due to the bitter taste of some coffees due to the poor quality of powder on the market.

Among consumers of this beverage, the main reason was the “personal pleasure”, followed by the “habit/tradition” of consuming coffee. The inverse was found in the seventh “Coffee Consumption Trends”, a study that aims to offer the market an overview about the habits and attitudes of coffee consumers, since the main reason to consume coffee was that it is an acquired habit since childhood/family tradition, followed by the fact of enjoying the taste of coffee (Associação Brasileira da Indústria de Café, 2008).

Regarding the methods of coffee preparation, in our study the most common form used was an infusion (cloth strainer or filter paper), and the use of decaffeinated coffee was low in the studied population. The methods of coffee preparation depend on the habits and culture of each place, but our findings are in agreement with other cross-sectional studies done in Netherlands and Finland (Van Dam et al., 2004; Bidel, 2008). In these European studies coffee was prepared as an infusion, using either soluble grounds or filter paper, and the consumption of decaffeinated coffee was also low. In the US, filtered coffee is also the most common coffee consumed (Lopez-Garcia et al., 2013). On the other hand, non-filtered coffee is the main method of coffee preparation in Spain and Greece (Lopez-Garcia et al., 2013; Panagiotakos et al., 2007). This method includes beverages prepared using pressure (espresso coffee), a percolator (a type of pot that brews coffee by passing boiling water over the grounds) and also instant coffee (Lopez-Garcia et al., 2013).

In our study, sugar was the main way of sweetening coffee that was used, followed by sweetener and the combination of both during the day. In agreement with our findings, Van Dam et al. (2004) observed that 44% of coffee drinkers used sugar in their coffee. In a nationally representative estimate of sugar-sweetened beverage consumption in the U.S. for estimating calories consumed from added sugars in all beverages, one of the top sources among adults was sweetened coffee (Miller et al., 2013). In addition, using data from the National Dietary Survey based on the first day of food record, Souza et al. (2013) calculated a 10% amount of added sugar for respondents who reported using sugar and a 5% amount of added sugar for respondents who reported using both sugar and non-caloric artificial sweeteners.

On the other hand, the influence of additives to coffee (milk, sugar, artificial sweetener) has not been well described in the literature, and these factors may contribute to the subsequent food choices made by consumers. The influence of additives on energy intake both in single and multiple meals remains to be more thoroughly examined (Schubert et al., 2014).

The majority of consumers reported drinking coffee with some food and more commonly with bakery products such as bread and cheese bread (“Pão de queijo” a traditional Brazilian recipe). Coffee is consumed as part of meals such as snacks and breakfast, or as ingredients for desserts and snacks. Machado et al. (2009) observed that there was significant trend in the proportion of coffee drinkers increasing in line with an increase in the intake of meat and eggs groups, oils and fats, appetizers and snacks. Sartorelli et al. (2010) also found an association with coffee consumption and dietary intakes of energy and saturated fat. This fact may explain the significant association of coffee intake and BMI found in our study, although the epidemiological literature suggests coffee and caffeine consumption are associated with attenuated weight gain (Pan et al., 2013). This subject is still controversial as Schubert et al. (2014) found no effect of coffee and caffeine on energy intake.

The results in our study revealed that approximately half of the participants reported consuming coffee at work. In line with this, a cross-sectional study carried out in 18 different public hospitals in the municipality of Rio de Janeiro, Brazil, observed that the total working hours were often associated with excessive consumption of fried food and coffee, lack of physical exercise and the greater occurrence of overweight and obesity (Fernandes et al., 2013).

In Brazilian culture, the consumption of coffee is part of the accepted norm, especially in work environments, as a form of social interaction (Fernandes et al., 2013). It has been observed that women with long stints of professional or total work hours tend to show an exaggerated consumption of coffee, a phenomenon that could be explained by the property of caffeine which provides energy to deal with daily activities in a satisfactory manner (Fernandes et al., 2013). The consumption of coffee, in moderate doses, could favour cognitive and psychomotor development, which is also necessary to be able to work long hours in a labour environment that needs maximum attention with a minimum of errors. However, high doses can cause negative experiences in the users, such as tachycardia, palpitations, insomnia and anxiety (Heckman et al., 2010).

The strengths of this study were the measurement of coffee using a self-reported questionnaire that permitted evaluation of different methods of coffee preparation, including caffeinated, decaffeinated, filtered and non-filtered, as well as the choice, reasons and preferences for foods eaten with coffee. Most information on these topics is obtained from market organization and not associated with health concerns. On the other hand, potential limitations should be considered when interpreting the results of this study, like the fact that the research was conducted by telephone interview, precluding individuals with no access to telephone lines. Taking this limitation into account, to our knowledge this is the first population-based study to associate coffee consumption with food choices and personal characteristics among adults from the Federal District.

## 5 Conclusion

In conclusion, many cups of coffee are consumed each day by adults from the Federal District, and this impacts on their health. The results in our study may suggest that the popularity of this beverage among coffee consumers can be attributed to

its taste, personal pleasure and habit, and consumption is more likely to occur with the advance in age and when any type of food is consumed. On the other hand, the main reason for not consuming coffee among non-consumers were “not liking” the taste and/ or aroma of coffee. This indicates that the motivations for consumption reflect the social significance of the beverage either at home, at work or among friends, and this is strongly associated with the habits and customs of Brazilian society. There is almost no information on the profile of consumers of this beverage, so it is important to follow the characteristics of the population that drinks coffee, which has a potential for nutritional interventions and is relevant in terms of public health.

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## Abbreviations

BRFSS: Behavioral Risk Factor Surveillance System; HBS: Household Budget Survey; IBGE: Brazilian Institute of Geography and Statistics; US: United States; BMI: Body Mass Index.